C.U.SHAH UNIVERSITY Winter Examination-2018

Subject Name : Geotechnical Engineering-I

	Subject	Code : 4TE05GTE1	Branch: B.Tech (Civil)	
	Semester	r :5 Date : 03/12/2018	Time : 10:30 To 01:30 Marks :	70
	Instructio (1) (1) (2) (1) (3) (1) (4) (2)	ons: Use of Programmable calculator & a instructions written on main answer Draw neat diagrams and figures (if r Assume suitable data if needed.	iny other electronic instrument is prohibited. book are strictly to be obeyed. necessary) at right places.	
Q-1	l	Attempt the following questions	:	(14)
	a)	Name the scientist who coined the	term 'soil mechanics'.	1
	b)	Chemical weathering of rocks occ	ur because of	1
	c)	Shape of clay particles is		1
	d)	The principle involved in the relat	ion $\gamma_{sub} = \gamma_{sat} - \gamma_w$ is	1
	e)	The maximum temperature reco content determination is	mmended in the oven dry method for water	1
	f)	What is the purpose of using Core	-Cutter method for soil?	1
	g)	The soil sample for the hydromete	r analysis is pre-treated with which agent?	1
	h)	A moist soil sample weighs 24gr Oven dry weight of tin and sample	n in a tin lid. The tin lid above weighs 14gm. e is 22gm. What is the water content of soil?	1
	i)	The symbol SP indicates which ty	pe of soil as per soil classification system?	1
	j)	When the plastic limit cannot be d	etermined, the soil is reported to be	1
	k)	The property of soil which allows	water to flow through it is	1
	l)	Define effective stress.		1
	m)	A sand has e=0.8 and the clay has	e=1.2, which is more pervious?	1
	n)	What is shear strength of soil?		1

Attempt any four questions from Q-2 to Q-8

Q-2		Attempt all questions		
	a)	Explain the structure of clay minerals. Also write about the clay particle – water relation in short.	10	



b) 225gm of soil was oven dried and placed in a specific gravity bottle and then 04 filled with water upto a constant volume mark made on the bottle. The mass of bottle with water and soil is 1650gm. The specific gravity bottle was filled with water alone upto the constant volume mark and weighed. Its mass was found to be 1510gm. Determine the specific gravity of the soil.

0-3 Attempt all questions

- a) Describe a hydrometer. Write the test procedure for hydrometer analysis of soils. 07 Also mention the corrections to be made to the hydrometer readings.
- **b**) 500gm of soil was used for sieve analysis. The masses of soil retained on each 07 sieve is given below. Plot a grain size distribution curve and compute the following:
 - a) Percentages of gravel, coarse sand, medium sand, fine sand and silt as per IS 1498
 - b) Uniformity coefficient
 - c) Coefficient of curvature

Also, comment on the type of soil.

IS Seive	2mm	1.4mm	1mm	500μ	250μ	125µ	75μ
Mass (g)	10	18	60	135	145	56	45

Q-4

Attempt all questions

- a) Explain the factors that affect permeability of soils.
- **b**) A trench is excavated in fine sand for a building foundation up to a depth of 4m. The excavation was carried out by providing the necessary side supports for pumping water. The water levels at the sides and the bottom of the trench are given in figure below. Examine whether the bottom of the trench is subjected to a quick condition if G=2.64 and e=0.7. If so, what is the remedy?



Q-5 Attempt all questions

- a) Explain the stress condition in soil due to surface tension forces.
- **b**) A recently completed fill was 10m thick and its initial void ratio was 1.0. The fill 06 was loaded on the surface by constructing an embankment covering a large area of the fill. Some months after the embankment was constructed, measurements of the



(14)

(14)

06 08

(14)06

fill indicated an average void ratio of 0.8. Estimate the compression of the fill.

c) Draw pre-consolidation pressure curve. Write the steps to obtain pre-consolidation 02 pressure from consolidation test results.

Attempt all questions (14)Q-6 Explain the types of consolidation occurring in soils. Mention why consolidation 06 **a**) study shall be carried out for a site. 06 **b**) A stratum of normally consolidated clay 7m thick is located at a depth of 12m below ground level. The natural moisture content of the clay is 43% and its liquid limit is 48%. The specific gravity of the soil particles is 2.76. The water table is located at a depth of 5m below ground surface. The soil is sand above the clay stratum. The submerged unit weight of the sand is 11kN/cum and the same weighs 18kN/cum above the water table. The average increase in pressure at the centre of the clay stratum is 120kN/cum due to the weight of a building that will be constructed on the sand above the clay stratum. Estimate the expected settlement of the structure. c) Derive relation between porosity and void ratio. 02 Attempt all questions (14)Q-7

- a) A stratumof normally consolidated clay of thickness of 3m is drained on one side only. It has hydraulic conductivity of $k=5x10^{-8}$ cm/sec and a coefficient of volume compressibility $m_v=125x10^{-2}$ cm²/sec. Determine the ultimate value of the compression of the stratum by assuming a uniformly distributed load of 250 kN/m² and also determine the time required for 20% and 80% consolidation.
- b) A mass of oven dried soil pat is 0.78N. When immersed in mercury the dry soil 07 displaces 4.75N of mercury. If the specific gravity of soil G=2.72, what is the shrinkage limit of the soil. Assume the specific gravity of mercury as 13.6.

Q-8		Attempt all questions	(14)
	a)	Write on the pycnometer method for soil test. Draw the sketch of pycnometer.	06
	b)	Write on the major soil deposits in India and also in the Gujarat region.	04
	c)	Give valid reasons why geotechnical engineering is essential for civil works.	04